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one of the fundamental constants of astronomy. While therefore we give to the present research very high praise, we do not doubt that Prof. Comstock himself would make not a few changes, if he had the work to do over again.

Among the things which might perhaps with justice be subjected to criticism is the insufficient manner in which the thermometers and the determination of the temperature of the air have been treated. This is, of course, a matter of vital importance when the constant of refraction is to be determined. Yet the thermometers from whose indications the refractions were computed were simply compared with a standard thermometer for the determination of their division errors, as well as their other errors. The standard thermometer itself was examined at the Signal Office in Washington, but no details are given as to the method used in the examination. In a research involving the fundamental astronomical constants all such details should be published. As a matter of fact, Prof. Comstock should have used only standard thermometers, and he should have determined their division errors and their fundamental points himself. He makes no statement as to his method of comparing his thermometers with the standard, and this very important omission leaves us entirely in the dark as to the possible uncertainty of the temperature determinations.

Another rather unusual thing is the manner in which Mr. Flint's observations have been treated. All of these observations which differed more than 1" from the mean of Mr. Comstock's own observations were rejected, and the others were given half weight. This was done because it appeared 'from an inspection of his (Mr. Flint's) individual results that they are peculiarly subject to large accidental errors.' It would probably have been better to have rejected all Mr. Flint's observa-

tions, especially as their number was not very large in comparison with Mr. Comstock's. The retaining of these observations will probably diminish somewhat the confidence felt by astronomers in the result of the research regarded as a fundamental constant. Yet they have probably had but very little effect on the final values obtained for the refraction and aberration, in view of the unusual method of weighting used.

THE *Astronomische Gesellschaft* has just published the eleventh part of its great star catalogue. It gives the positions of 9,789 stars in the zone from 15° to 20° North declination, observed at Berlin by Prof. Auwers. This brings the total number of stars in those parts of the *Gesellschaft* catalogue already published up to 72,951. The published zones now cover all the sky between the equator and 80° North declination, with the exception of the zones 5° to 15°, 25° to 40°, and 70° to 80°. The Cambridge (England) zone, 25° to 30°, is announced as in press, so that its publication may be expected during 1897.

WE note the appearance of the 1896 volume of the *Anuario publicado pelo Observatorio do Rio de Janeiro*, and of the 1890 volume of the Washington Observations. The latter contains as an appendix the new catalogue of stars derived from the zone observations made at Santiago de Chile by the U. S. Naval Astronomical Expedition under Lieut. J. M. Gilliss, in the years 1849 to 1852. The catalogue gives the place of 16,748 southern stars.

THE Cape of Good Hope Meridian Observations for the years 1888 to 1891 have also appeared, as well as the volume of Greenwich Observations for 1893. H. J.

SCIENTIFIC NOTES AND NEWS.

FIELD WORK OF THE GEOLOGICAL SURVEY.

THE field work of the United States Geological Survey is still going actively on in all

directions. There are about 30 geologic and paleontologic parties in the field, a large force of topographic surveyors and a large force engaged in the several branches of hydrographic work. The scope of the work of stream gauging and investigating the subject of underground currents and artesian wells has been materially extended this year.

THE Director spent several weeks studying the Cambrian rocks and faunas of southwestern Nevada, and at last reports was in the desert region in Inyo county, Cal. He will not return to Washington before November 1st. In his absence Col. H. C. Rizer, the Chief Clerk, is the executive head of the Survey.

MR. R. T. HILL, who went to Indian Territory to continue his studies of the geology of the region, was soon forced to discontinue by a severe attack of malarial fever. His condition was for sometime a precarious one, but he is now on the road to recovery. The topographic force in Indian Territory suffered a great deal from malarial fever in August and September.

POPULAR INSTRUCTION IN NATURAL HISTORY.

ACCORDING to the London *Times* an experiment has been undertaken in London which might with advantage be tried in America. The Library Commissioners of the public library of St. George's, Hanover Square, London, have set apart a large room for the study of natural history on a plan presenting several novel features. The essential point is the combination of a complete library with a museum so arranged as to be self-explanatory. The two are the proper complements of each other, and together form a thorough introduction to natural history, or *gradus ad naturam*, as it may be called, the like of which has never yet been offered to the public. Both the books and the specimens are an anonymous gift, and they represent the labors of a lifetime.

The collection is so arranged and classified as to give the elementary student an intelligent grasp of the whole domain of natural history or of any section of it. The general idea is to lead on from one thing to another. A few choice cases are placed on the landing outside

the room to attract the attention of the casual visitor, and a plan of the collection meets his eye before entering. Inside he finds himself confronted by a general scheme of the whole subject, equally clear, simple and comprehensive. It strikes the keynote of the collector's purpose, which is to 'start with the foundation of a systematic classification,' and it enumerates with illustrations 'the 25 classes of the animal world.' A few quotations from this scheme will exemplify the method adopted. The 25 classes are grouped in five divisions, and the first of these is described as follows:

Division I. (the 'backboned animals') contains Classes 1 to 5—namely: (1) mammals; (2) birds; (3) reptiles; (4) amphibians; (5) fishes. They are all alike, because they have: (a) an inside framework of bone; (b) a long backbone; (c) a spinal cord; (d) four limbs; (e) red blood; and they are called BACKBONED ANIMALS (*vertebrata*.)

Each class is further described in a parallel column and illustrated by a specimen. Thus, Class 1 is illustrated by a dormouse, with the following description:

This dormouse and similar backboneed animals feed their young with milk, are covered with hairs, prickles or spines; their four limbs end in feet, hands, scrapers or paddles; they have a four-chambered heart and warm blood; they breathe with lungs, and (as they feed their young with milk) they form Class 1, MAMMALS (*mamma*, a teat).

THE U. S. COAST-LINE BATTLE-SHIP 'OREGON.'

THE *Journal of the American Society of Naval Engineers*, in the issue of August, 1896, contains an article of great value and interest, by Mr. Leo D. Morgan, on the Contract-Trial of the 'Oregon.'

This is a sister ship to the 'Indiana' and the 'Massachusetts,' a twin-screw, armored coast-line battle-ship, displacing 10,250 tons at 24 feet draught, and was built by the Union Iron Works of San Francisco, at a cost of \$3,180,000 plus \$43,000 for changes in construction while under contract. The contract-trial of this great iron-clad took place in May last, and the recorded and officially accepted speed was reported as 16.79 knots. The guaranteed speed was 15 knots, and the contractors won a bonus of \$175,000 on the excess above that figure. Had the speed fallen below the guarantee, they

would have forfeited the same figures—\$25,000 for each quarter knot variation from the contract. The speed attained exceeded that reached by either of the sister ships. The armor of the 'Oregon' is of nickel-steel, 18 to 8 inches thick on the sides, amidships, tapering from its upper to its lower edge. The casemate armor is 4 inches thick, backed by plates $2\frac{1}{2}$ inches thick. The turrets are covered by armor of from three and four inches thickness over the smaller guns up to 15 and 17 inches over the 13-inch rifles.

The battery is made up of four 13-inch B. L. rifles, eight 8-inch, and four 6-inch guns, with a quantity of 'rapid-fire' and 'machine' guns.

The engines are two triple-expansion, inverted, direct-acting machines, placed side by side in compartments fitted with water-tight doors. Their plan is that usual, in the main, in naval machinery, and they are made exceptionally light and strong by the employment of steel in frames and running parts wherever practicable. Each engine has three cylinders of $34\frac{1}{2}$, 48 and 75 inches diameter, respectively, and a piston-stroke of 42 inches. The ratios of cylinder areas are 1,957 and 2,455, or a total ratio of high to low of 2,697. The clearances are from 14 to above 15 per cent. The screws are of 15 feet diameter and 16 feet mean pitch. They are of the Griffith form, 3-bladed, and increasing in pitch fore and aft. The cooling surface of the condensers is 6,352.5 square feet, in each engine; the boilers have a total of 16,832 square feet of heating surface, one-third more than the total cooling surface of the condensers. The grate-surface is of 552 square feet area, and the ratio of H. S. to G. S. is 30.5 to 1. A forced draught is employed at full speed. Three electric light and power 'plants' are installed—24-kilo-watt, G. E., machines, making 400 revolutions a minute and generating an output of 300 amperes at 80 volts. They are driven, each, by a vertical, compound engine, $8\frac{1}{2}$ and 13 inches diameter, by 8 inches stroke. Six hundred and six lights are distributed about the ship, and four 25,000 candle-power search-lights are mounted on the pilot house and bridge. They take an 80-ampere current at 50 volts. The contractor's engine-room force was one chief engineer, in charge,

one in the fire rooms, four engineers in the engine and fire rooms, 16 oilers, 16 machinists, 4 storekeepers, and 4 wipers in the engine room; 37 firemen, 37 coal passers, 8 water tenders, in the fire rooms; 16 oilers and 11 machinists and 4 helpers, on the deck and in the smaller engine rooms—a total of 161 men. The steam pressure on the trial was continuously 163 pounds per square inch by gauge. The engines made 128 revolutions per minute, and developed 10,890 I. H. P. total.

The coal consumption amounted to 2,123 pounds per I. H. P., 33.3 per square foot of grate, and 1.22 per square foot of heating surface; while the cooling surface of the condensers had a ratio of 1.22 per I. H. P., and the boiler heating surface 1,745 per I. H. P.

This is a good example of the best work of modern naval establishments, and illustrates well the ability of the construction and engineer's bureau of our own navy department. The ship combines speed and offensive and defensive power in a degree which excites the wonder and admiration of even those who are most familiar with the advances made in recent years in the arts of naval construction and steam engineering.

R. H. T.

GENERAL.

A STATUE to Pasteur has been unveiled at Alais, in the center of the French silkworm district.

At the opening of the *Versammlung Deutsche Naturforscher und Aertzte*, at Frankfurt, on September 21st, there was laid the foundation stone of a monument to von Sömmerring, the eminent physiologist and anatomist, who died in 1830.

Nature states the monument to Lobachevsky, erected at Kazan, in a square which bears the name of the great geometer, was unveiled on September 13th, in the presence of the Bishop of Kazan, the Governor of the province, the University, the local Physical and Mathematical Society, and a great number of sympathizers. The Mayor of Kazan made a statement as to the funds raised for the erection of the monument. Prof. Suvoroff referred to the scientific work of Lobachevsky in mathematics and physics, and Prof. Vasilieff spoke of the great geometer as one whose life was worthy of emulation, and as

an energetic worker for spreading scientific knowledge. In the evening the Physical and Mathematical Society held a special commemoration meeting before a distinguished gathering of visitors of both sexes.

THE following is an official list of men of science who are expected to attend as delegates the sesquicentennial celebration of Princeton College:

Henri Moissan, Member of the French Academy of Sciences and professor of chemistry in the University of Paris.

Felix Klein, professor of mathematics in the University of Göttingen.

Joseph John Thomson, Cavendish professor of Natural philosophy in the University of Cambridge.

A. A. W. Hubrecht, professor of zoology in the University of Utrecht, Holland.

Edward Baynall Poulton, Hope professor of zoology in the University of Oxford.

Wilhelm Dörpfeld, First Secretary of the German Archaeological Institute, Athens, Greece.

Sir J. William Dawson, emeritus professor of geology in McGill University, Montreal, Canada.

J. Willard Gibbs, professor of mathematical physics in Yale University.

George Lincoln Goodale, Fisher professor of Natural History and director of the Botanic Garden in Harvard University.

George William Hill, President of the American Mathematical Society.

Herman von Hilprecht, Curator of the Babylonian antiquities in the University of Pennsylvania.

S. P. Langley, Secretary of the Smithsonian Institution.

Joseph LeConte, President of the American Geological Society and professor of geology and natural history in the University of California.

John W. Mallet, professor of chemistry in the University of Virginia.

Dr. Silas Weir Mitchell, Philadelphia.

Simon Newcomb, editor of the Nautical Almanac and professor in Johns Hopkins University.

Henry A. Rowland, professor of chemistry and director of the physical laboratory in Johns Hopkins University.

MEMBERS of the Biological Section of the New York Academy of Science have subscribed \$250 to the Huxley Memorial Fund.

THE Council of the New York Academy have extended an invitation to Prof. Henri Moissan, the distinguished French chemist, who represents

the University of Paris at the Princeton sesquicentennial, to lecture before the Academy and the other scientific societies of New York.

At the meeting of the New York Academy upon Monday evening, October 5th, the number of honorary members was increased to 43 by the election of Prof. Felix Klein, of Göttingen; Prof. J. J. Thompson, of Cambridge, and Prof. Henri Moissan, of the University of Paris.

THE Academy of Natural Sciences of Philadelphia has conferred the Hayden Memorial Geological award for 1896 on Prof. Giovanni Capellini, of the University of Bologna.

MR. E. GERRARD, who, for more than fifty years, has been an attendant in the British Museum, has retired.

WITH the October number *Science Progress* becomes a quarterly, instead of a monthly, as hitherto. The journal, conducted by Mr. Henry C. Burdett and edited by Mr. J. Bretland Farmer, with the cooperation of an able editorial committee, was founded two and a-half years ago, and has maintained a uniformly high standard of scientific excellence.

A NEW medical monthly journal is to be started shortly in Edinburgh. The prospectus has not yet been issued, but it is understood that the journal is to represent and be owned by the Scottish medical profession.

SIR GEORGE M. HUMPHRY, professor of surgery and formerly professor of anatomy at Cambridge University, died on September 24th.

THE death is announced of Mrs. Darwin, the widow of Charles Darwin.

MR. HENRY D. VAN NOSTRAND, a New York business man, died on October 9th. He had made contributions to conchology and leaves a collection of shells of great value.

Natural Science states that G. A. Baer, of Paris, has gone to Peru to investigate the insect fauna.

DR. R. DEC. WARD, of Harvard University, has exhibited in the museum of the University a collection of about seventy photographs which he has taken to show the damage done by the St. Louis tornado, May 27, 1896, with special reference to its scientific aspects.

At Blue Hill Observatory, on October 8th, Messrs. Clayton, Ferguson and Sewatland sent a series of kites carrying a meteorograph to a height of 9,385 feet, more than three miles of piano wire being used. The temperature fell from 46° at the hill to 20° at an altitude of 8,750 feet.

It is proposed to organize at the University of Pennsylvania a mathematical club. A preliminary meeting will be held on October 16th, at which a paper setting forth the objects of such an organization will be read by Dr. E. S. Crawley.

The seventh Congress of the Italian Medical Society will be held in Rome, beginning October 20th. The ninth Congress of Italian Alienists was held at Florence, beginning October 5th.

It is stated that in the great cyclone which passed over Paris on Thursday, September 10th, damage to the extent of \$15,000 was done at the Musée d'histoire naturelle.

THE archaeological and paleontological museums of the University of Pennsylvania have recently received from H. W. Seaton-Karr, of England, by exchange, a collection of flint implements secured in Somali Land, South Africa.

It is announced in *Nature* that it is proposed to establish an International Botanical Station at Palermo, under the superintendence of Prof. Borzi, who desires the cooperation of botanists of all countries.

MR. GEORGE F. BECKER, of the United States Geological Survey, has returned to Washington after an absence of six months in South Africa. He visited the diamond mines at Kimberley, but spent most of his time near Johannesburg, studying the gold deposits. A projected trip through the Chartered Company's territory was prevented by the Kaffir war. Mr. Becker expects to print some of his results during the winter, but probably, in England; his data having been collected at the expense of English capitalists.

It is stated in the daily papers that the Mt. Lowe observatory at Echo Mountain, California, has been placed in the hands of a receiver, and that Mr. Lewis Swift, the astronomer, will

probably remove his telescope and other instruments to some other point.

THE *Lancet* states that the memorial stone of the Hope Hospital for Langholm was laid on the 21st inst., by Miss Hope, of New York. The hospital is one of the results of a sum of £100,000 left by the late Mr. Thos. Hope, of New York, to Langholm as his native place, the capital to be administered by trustees for the benefit of the inhabitants. The building is to be a very handsome one, and the plans are in every respect drawn on a most liberal scale. The cost is estimated at £17,000.

ACCORDING to the New York *Sun*, Rockall, a desolate rock rising only seventy feet above the sea, between Iceland and the Hebrides, is to be made an English meteorological station. It lies 250 miles from land, the nearest point to it being the little island of St. Kilda, 150 miles away, and itself nearly a hundred miles from the main group of the Hebrides. Rockall is in the path of the cyclonic disturbances on the Atlantic, and the station there would give timely warning of storms approaching the British coast.

WE announced recently the resignation of the professor of hygiene in the University of Moscow, F. F. Jerisman. It is reported that he has been excluded from further service at the University by the Ministry of Instruction, owing to his liberal views in political matters.

THE international race for horseless carriages from Paris to Marseilles and back, on October 3d, was won by carriages propelled by Daimler motors. The distance of 1,100 miles was covered in seventy-two hours. Of the thirty-eight carriages that started two were run by steam and the others by petroleum.

ACCORDING to the *Progrès médical* vaccination is carried out in Texas by sending a squad of policemen with the physician who cover the patient with their revolvers while the operation is being performed. The French paper thinks that this system has many merits and should be adopted in France. We are also informed by a French journal, *La Nature*, that silver has been transformed into gold in America, not referring to the recent action of one of our political parties nor even exclusively to the case

recently reported in the newspapers, but naming two of our most prominent inventors and two of our leading men of science among the alchemists.

A BACTERIOLOGICAL laboratory has been established at Angiers, France, with an annual appropriation of about \$500.

PROF. H. NEWELL MARTIN'S 'The Human Body,' one of the text-books in Henry Holt & Co.'s admirable American Science Series, has been revised by the author for the seventh edition just issued. It is the longer of the three courses in the subject, all of which have long been accepted by men of science and teachers as model text-books. In this edition new matter has been added, especially on the cardiac and vascular nerves and on the physiology of the brain, and many pages have been rewritten. The author's style is unusually clear, the subject-matter is free from both dogmatism and indefiniteness, and the book remains the best compendium we have covering the anatomy, physiology, psychology and hygiene of the human body.

THE rapid development now sure to take place in the manufacture and use of auto-mobile carriages has been long delayed. As early as 1834 the British Parliament appointed a select committee to "enquire into and report upon the tolls and prospects of land carriages by means of wheeled vehicles propelled by steam or gas on common roads." According to *Power and Transmission*, the report of the committee may be summarized as follows: 1. "That carriages can be propelled by steam on common roads, and at an average of ten miles an hour. 2. That at this rate they have conveyed upwards of fourteen passengers. 3. That their weight, including engine, fuel, water and attendants, may be under three tons. 4. That they can ascend and descend hills of considerable inclination with facility and ease. 5. That they are perfectly safe for passengers. 6. That they are not (or need not be if properly constructed) nuisances to the public. 7. That they will become a speedier and cheaper mode of conveyance than carriages drawn by horses. 8. That, as they admitted of greater breadth of tire than other carriages, and as the roads

are not acted upon so injuriously as by the feet of horses in common draught, such carriages will cause less wear of roads than coaches drawn by horses. 9. That rates of toll have been imposed on steam carriages which would prohibit their being used on several lines of road were such charges permitted to remain unaltered."

WE have already called attention to the memorial to the late Dr. D. Hack Tuke, which will probably take the form of a library in connection with the British Medico-psychological Association, to which Dr. Tuke's library has already been given. An American committee has been formed and subscriptions for the memorial may be sent to Dr. Charles W. Pilgrim, Poughkeepsie, N. Y.; Dr. Charles G. Hill, 317 North Charles Street, Baltimore, Md., or Dr. Frank C. Hoyt, Clarinda, Ia.

THE *Lancet* states that, in the *Berliner Klinische Wochenschrift* of August 31st, a paper is published by Dr. C. Kaiserling, describing a process for preserving tissues which he has introduced, and with very encouraging results. The organ to be preserved is first placed in a solution of the following composition; Formalin, 750 c. cm.; distilled water, 1,000 c. cm.; nitrate of potash, 10 grammes; acetate of potash, 30 grammes. The organ is disposed in such a position as to preserve its form as far as possible, and the fluid should be large in proportion to the size of the specimen. This solution does not abstract any color, but remains quite clear, and can be used for a large number of specimens. An immersion of twenty-four hours in the fluid is sufficient for any tissue, but double this period will not do any harm. The organ is then allowed to lie for twelve hours in 80 per cent. alcohol and then for two hours in 95 per cent., and is subsequently preserved in equal parts of water and glycerine, with the addition of thirty parts of acetate of potash. Very delicate tissues, such as intestine, are best kept in equal quantities of glycerine and water after the addition of absolute alcohol in the proportion of one part of alcohol to ten of the mixture. By this method Dr. Kaiserling has succeeded in retaining the natural color of blood and the transparency of

nearly all organs. The substance of the brain is particularly well preserved, areas of softening, hemorrhages, and pus in the pia mater being very well demonstrated.

UNIVERSITY AND EDUCATIONAL NEWS.

THE fourth annual report of President Schurman, of Cornell University, has been presented to the trustees at an early date. The report extends to 79 pages with appendices of about the same length and gives a full account of the recent progress and present condition of the University. We have already noted the new appointments and other enlargements such as the establishment of the State Veterinary College. The total number of students in the university last year was 1,702. The absolute and relative increase in those taking scientific courses is shown to be as follows:

	1891-92	1892-93	1893-94	1894-95	1895-96
Arts.....	142	141	138	133	146
Philosophy..	100	110	121	136	153
Science	82	89	89	115	144
Letters.....	94	82	85	65	50

There has, however, been a decrease in the number of students attending the technical courses, owing to the fact that the requirements for admission were advanced in 1894.

IN view of the destruction of the main building of Mt. Holyoke College by fire, the trustees are considering the removal of the College from South Hadley. Springfield and Worcester have been mentioned as possible locations for the College.

THE councils of University College and King's College, London, have inaugurated a series of lectures and demonstrations of university character for the benefit of students unable to attend in the day time. The program for the present session includes courses on mechanical engineering, on electrical engineering and on practical chemistry by the professors at University College, and courses on civil engineering, on architecture, on experimental and practical physics and on pure mathematics by the professors at King's College.

THE Woman's College of Baltimore has recently received, as a gift from the Rev. George C. Stull, of Butte, Montana, a collection of

about 200 Montana ores and minerals. The specimens are carefully determined, labeled and catalogued, and are accompanied by chemical analysis. Gold, silver, copper and antimony are well represented, and the whole collection makes a nearly complete series of the ores and useful minerals from Montana.

THE Enoch Pratt Free Library, of Baltimore, has just completed the building of its sixth branch library. It is situated near the Woman's College, and will be largely used by the students. The librarian, Dr. Steiner, has requested lists of desired books from the professors of the College. Lists of scientific books have been sent by Dr. Metcalf and Miss Bunting, of the biological department.

BISHOP J. J. KEANE, rector of the Catholic University of America, in Washington, has resigned at the request of Pope Leo XIII.

WILLIAM S. EICHELBERGER, PH. D., for the past four years instructor in mathematics and astronomy at Wesleyan University, has resigned, to accept a position in the Nautical Almanac Office in the Naval Department at Washington, D. C.

AT the New York University Dr. T. W. Edmondson has been appointed associate professor of physics, and Mr. J. H. MacCracken instructor in philosophy. Prof. W. M. Warren has been promoted to a full professorship of philosophy in Boston University. At Williams College Dr. H. M. Knowler has been appointed instructor in biology and Mr. J. R. Congdon assistant in physics.

DISCUSSION AND CORRESPONDENCE.

THE GEOLOGY OF BLOCK ISLAND.

AN article with the above title by Prof. O. C. Marsh, in the *American Journal of Science* for October, 1896 (pp. 295-298), is chiefly remarkable for the manner in which the work of previous observers is ignored and the ingenuous way in which well-known facts are stated as if they were original discoveries by the author. The structure of the Island was described by both Upham* and Merrill,† and the parallelism be-

* *Am. Journ. Sci.*, xviii. (1879), p. 92.

† *Trans. N. Y. Acad. Sci.*, xv. (1895), pp. 16-19.